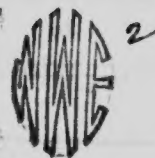


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DIVISION OF HORTICULTURE

THE POTATO IN CANADA

ITS CULTIVATION AND VARIETIES.

BY
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Dominion Horticulturist

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THE POTATO AND ITS CULTIVATION IN CANADA.

POPULAR EDITION.

By W. T. MACOUN, *Dominion Horticulturist.*

The potato is used almost as freely as bread in Canada, and, like that food, is thought as much of by the rich as by the poor. It can be obtained at all seasons of the year, and, if properly kept, is about as good at one time as at another. Being one of the most useful food products, its cultivation and improvement deserve the greatest attention.

The potato succeeds well everywhere in this country, where the season is long enough for the tubers to develop before the tops are killed by frost, hence potatoes are cultivated in practically every settlement in Canada, even up to, and within, the Arctic circle.

Although the potato is one of the most important food products of Canada, the methods of culture employed in growing this crop can be very much improved. This bulletin is published for the purpose of giving information to Canadian farmers, which should help them to obtain much better crops than they have hitherto had. The recommendations made are for the most part based on the results of experiments conducted at the Central Experimental Farm during the past thirty years, although the results of the work of other experimenters have not been overlooked, and have also been used when deemed advisable.

In the province of Ontario, where records in regard to the potato crop have been kept for thirty-six years, 1882-1917, the average yield for that period has been only 114.7 bushels per acre. Some of the best farmers in Canada grow from 400 to 500 bushels per acre, and even larger yields are obtained, while 300 bushels per acre is not unusual. At the Central Experimental Farm the highest yield on a small plot was at the rate of 772 bushels per acre, but careful experiments have demonstrated that potatoes can be produced at the rate of over 1,000 bushels per acre. While in field culture such high yields may not be possible, they are something to strive for, and there is no doubt but that the average yield for Canada could be doubled if the best methods were employed by every grower.

CLIMATE AND SOIL.

The potato appears to thrive best in a moist, somewhat cloudy and temperate climate, but providing there is sufficient moisture in the soil and the growing season is long enough it is not at all fastidious in this respect. It is a little more particular in the matter of soil, but large crops are grown in a great variety of soils. The ideal soil for potatoes appears to be a rich, deep, friable, warm sandy loam with good natural drainage, and well supplied with decayed or decaying vegetable matter. The potato requires a large amount of moisture to develop a large crop of potatoes, and for this reason the soil should be retentive of moisture. Potatoes will not, however, succeed well in cold soil where the water is stagnant near the surface, and thorough drainage is very essential to a good crop.

Potatoes succeed admirably on new land providing it is well drained and not too stiff, as the soil is filled with decayed vegetable matter and humus which help to make it loose. Such soil retains moisture well, and furnishes nitrogen in a very available form. They succeed well after sod also, as the decaying sod gives somewhat the same conditions as new land. Clay and clay loams are not so suitable to the potato crop as the warmer sandy loams and gravelly soils as they are usually colder and being, as a rule, stiffer, the tubers are not as even in shape nor as smooth. The quality of the potatoes grown in sandy or gravelly soils is better than that of those grown in clay or clay loams.

PLANT FOOD REQUIREMENTS AND FERTILIZERS.

Potatoes usually succeed well when grown after clover sod. In an experiment at the Central Experimental Farm, covering three years, there was an average increase of thirty-seven bushels per acre of potatoes where clover had been sown with grain and ploughed under, over the plot where no clover was grown. Experiments have shown that the crop of grain is not lessened by sowing clover.

It will be readily seen that clover and barnyard manure are two very important and cheap fertilizers for the potato. The former obtains nitrogen from the air and brings up phosphoric acid and potash from great depths of the soil to be available for succeeding crops and in adding humus to the soil by its decay it makes the soil hold moisture better and renders it looser. Barnyard manure adds nitrogen, phosphoric acid and potash to the soil and increases the supply of humus in it, making the soil more retentive of moisture and looser.

From the information obtained from experiments at the Central Experimental Farm and elsewhere, the writer would recommend growing potatoes after clover which had been top dressed with from ten to twelve tons of barnyard manure per acre. If the clover is ploughed under in the autumn, green manure would be the best; if ploughed under in the spring, which is the better time, rotted manure is preferable, as it will become incorporated with the soil better than green manure and is not so likely to favour development of scab. The clover may be top dressed with green manure in late summer or autumn, even though the clover is not ploughed under until spring, in which case the manure increases the crop of clover for turning under and is sufficiently broken up and mixed into the surface soil to be in good condition for mixing with it when ploughed under. Potatoes succeed well after corn which has been given a heavy application of barnyard manure. It is better to manure heavily for the preceding crop than for the potato crop.

PREPARATION OF THE LAND.

The soil for potatoes should be well prepared before planting. Unlike some crops which succeed best when the soil is moderately firm when ready for seeding the potato succeeds best in soil which is loose. In loose soil the tubers will be smooth and shapely; in soil which is firm or stiff the potatoes are usually misshapen and not nearly so attractive. The ploughing under of barnyard manure and clover makes the soil looser and this, added to their value in furnishing plant food, makes them particularly desirable. Soils which are very light and loose may be made too loose by the turning under of manure, especially when it is green and strawy, and while it is not the best practice to plough under green manure immediately before planting, especially on light soils, if it is done the soil should be given extra tillage so as to incorporate the manure with it thoroughly and keep the first few inches of soil from drying out and preventing the satisfactory sprouting of the potato sets.

Spring ploughing for the potato crop is usually best. Where rather stiff soil has to be used, fall ploughing may be preferable as the action of the frost upon it will help

to loosen it. Good potato land should be ploughed in the spring, turning under the clover with its top dressing of manure. The soil should be ploughed deep enough so that the clover will be well covered. Different methods of preparation will be necessary for different kinds of soil, but the nearer the land can be got into a thoroughly pulverized condition to a depth of about six inches or more before planting time the better the crop will be. When a planter is used, the soil should be ploughed, thoroughly harrowed, and then rolled just before planting.

When rotted barnyard manure is used on land without clover it should be applied in the spring and thoroughly mixed with the soil. If it is well rotted it may be harrowed in. Neither rotted nor fresh manure should be put in the drill with the sets, as manure when it comes in contact with the tubers favours the development of scab. This was well proven in experiments at the Central Experimental Farm.

PLANTING POTATOES ON GREEN SOD.

If the land has been ploughed the potatoes could be planted by opening holes for the sets about four or five inches deep and fourteen inches apart, making the rows 24 feet apart, the manure having been spread over and harrowed in with the disc harrow. If the sod has not been ploughed one of the best methods of planting in green sod is to have some one planting when the ploughing is being done, the sets being dropped every third furrow and covered by the plough, when the next furrow is made. After the potatoes have been planted the ground is disc harrowed and if it is light soil it may be rolled after that to help close up any openings where grass could grow through and to compact the soil somewhat and hasten the rotting of the sod. This would not be desirable where the ground was heavy, as it would make it too firm. As soon as weeds start, harrow with the smoothing harrow and as soon as the potatoes are showing above the ground harrow again, then if thorough cultivation is followed afterwards and the tops protected from insects and disease, there should be a good crop.

TIME OF PLANTING.

The best time for planting potatoes will vary in the different parts of Canada, much depending on the condition of the ground and spring frosts, but when these have not to be considered the earlier the potatoes are planted the larger the crop is likely to be. The sets should not lie long in the ground before sprouting, as there is danger of rotting, hence they should not be planted when the soil is cold and wet. If they are planted too early also the young vines are liable to get nipped by spring frosts. As early potatoes usually command good prices it is often worth taking the risk of frost and planting early if the soil is in good condition. If the vines should be above ground and there is danger of frost they may be covered slightly with the soil by turning a shallow furrow over them. Potato growers have saved their vines by doing this.

IMPORTANCE OF SOURCE AND VITALITY OF SEED.

In an experiment carried on at the Central Experimental Farm in 1917 with seed from Fredericton, N.B., Port Arthur, Ont., and Ottawa, the following yields were obtained: Total yield per acre, Fredericton seed, 341 bushels; Port Arthur seed, 400 bushels 24 pounds; Ottawa seed, 85 bushels 48 pounds.

The importance of seed from different sources has been confirmed by experiments conducted at the Agricultural College, Guelph, Ontario.

Just as marked differences were obtained in other years.



Experiment showing importance of change of seed—Taller plants from Indian Head seed; shorter plants of the same varieties from Ottawa seed.

WHEN TO CHANGE SEED.

When a grower has found that it pays him to obtain seed of a certain variety from a certain source, he should endeavour by experiment and calculation to learn whether it will pay him to change his seed every year, every two years, or every three years.

The cause or causes of the very low yields at the Experimental Farm, Ottawa, during recent years from seed grown at Ottawa the previous year, are not yet clearly understood. The low yields began in the very dry seasons of 1906, 1907, and 1908, and there have been few good years for potatoes since, and, since that time, the diseases such as Leaf Roll, mosaic and *Rhizoctonia* all have been found affecting the potato plants at Ottawa. How far these are the primary cause of the low yields and how much should be attributed to climate, is not yet certain, but the fact remains that by getting new seed every year from certain places, good yields can be obtained. While such marked results might not be obtained elsewhere, as at Ottawa, a change of seed is recommended where satisfactory yields are not being obtained. It has been the writer's observation that wherever potatoes grow vigorously, as a rule, until the tops are cut down by frost in the autumn, there will good seed potatoes be obtained, provided they are free from disease. Such sources of seed potatoes can be found in all the provinces of Canada and particularly in those parts of the provinces where the days and nights, during the growing season, are relatively cool, and where there is usually a good supply of moisture in the soil.

It has been shown by the experiments at Ottawa that the best results were obtained from the most immature seed, and while, doubtless, there is some other factor or factors than immaturity which ensure such good results from seed from the cooler parts of Canada, and which for the present may be called "vitality," it would seem, with our present knowledge, that the best seed will come from those parts of Canada

where, as a rule, the main part of the crop is most immature, though of good marketable size, when the tops are cut down by autumn frosts, and where there is little or no disease in the crop.

IMPROVEMENT BY HILL SELECTION.

After a variety has been originated, and after its general characteristics have been sufficiently fixed to introduce it, a variety may be changed, to some extent, by careful selection. This may be undertaken for the purpose of increasing the yield or to obtain a variety which is earlier or later, shallower in the eye, or of better shape. Selection may also be made to obtain a potato which is more resistant to disease and drought, better in quality, or with a higher percentage of starch, but while selection is desirable there needs to be more experimental evidence to show that marked, permanent changes in a variety can be made in this way.

The most accurate way to carry on hill selection is by the individual tuber or tuber-unit method by which the yield from each individual tuber is kept separate.

A simple method of selection, and one which will be found to give good results, is to dig enough of the general crop by hand each year so that enough seed can be selected from good hills to give a sufficient quantity of seed for the general crop. By this method the poor hills including potatoes of low vitality and those affected with disease are eliminated and the standard raised. This is perhaps the best method of selection for the average farmer.

While the methods of selection described are mainly for the purpose of increasing the yield, it is desirable to select at the same time for purity, trueness to type, improvement of shape of tuber, resistance to disease, and anything else which will improve the value of the crop.

KIND OF SETS TO PLANT.

Many experiments have been tried to determine the best kind of sets to plant, and, on the whole, it has been found that good marketable tubers cut into pieces so as to have, at least, three good eyes to a piece, and a liberal amount of flesh, are the best. A medium sized potato should make three to four sets, cutting the potato lengthwise and then across, when four are made. The less potatoes have sprouted in the dark the better the seed will be, hence they should be kept as dormant as possible by storing in a cool place.

CONDITION OF SETS WHEN PLANTED.

The sooner the sets are planted after the potatoes have been cut the better the yield will be. The sooner the sets are covered after they have been dropped in the field the larger the yield will also be. Coating the sets with land plaster or lime will also materially increase the yield.

BEST DEPTH TO PL

It is important to know the most economical depth to plant potatoes, as there is no doubt that different depths of planting will give different results, but there will not be the same results on all soils. The yield, however, is not the only point to be taken into consideration, the question of labour being important also. While shallow planting has given the best yields at Ottawa in loose, sandy loam soil, the most economical depth is from four to five inches for good loamy soils on account of the harrowing which is necessary to destroy weeds and which would dig out sets which were planted shallower. Sets should be planted deeper in soils likely to dry out than in others more retentive of moisture.

From the results obtained it would seem clear that where early potatoes are wanted, the sets should be planted shallow in the warm soil. Although the best results have been obtained in sandy loam soil which was well supplied with moisture by planting only one inch deep, this method is not recommended for general field culture. Unless the surface of the soil is kept loose and free from weeds, the potato crop will not be large. In order to kill a large proportion of the weeds which grow, the ground should be harrowed once or twice before the potatoes come up or just as they are coming up, and if the sets were only one inch deep they would be dragged out, hence from 4 to 5 inches is the most satisfactory depth to plant.

DISTANCE APART TO PLANT.

It is important to know the most economical distance apart to plant the sets, so as to get the largest yields with the least amount of seed. Those varieties which have small tops may be planted a little closer than those kinds which are more vigorous. At the Central Experimental Farm an experiment has been conducted for eight years to determine the most economical distance apart in the rows to plant varieties of average vigour. After deducting the seed the net average yield was greatest from the sets planted in rows 2½ feet apart, with the sets 14 inches apart in the rows, though those planted 12 inches apart yielded nearly the same. Experiments on branch Farms and Stations confirm this distance as being the best in most places in Canada. Where potatoes are highly ridged, rows 3 feet apart might be better.

PLANTING AND COVERING.

The best method of bringing the land into good condition having been discussed, also the time to plant, kinds of set to use, depth and distance apart to plant, it remains before taking up the question of cultivation to say something about the actual planting itself. A common method among farmers is to open the furrows, drop sets by hand and close the furrows with an ordinary plough. This is not the best way. A better plan is to open the furrows with the double mould board plough, making them deep enough, so that when the potatoes are covered and the soil levelled the sets will be from four to five inches below the surface. The furrows may also be covered with this implement. When covered with either of these ploughs the soil should be levelled afterwards with the smoothing harrow. Some good growers use an implement with two concave discs for opening and closing the furrows, as, where clover is ploughed under, it is sometimes dragged out when the furrows are made with the plough.

The most satisfactory method of planting, however, for one with a fairly large or large area to cover, is with the potato planter, of which there are several good ones now on the market.

The potato planter makes the row, opens the furrows, plants or drops the sets, covers them and applies commercial fertilizers at the same time if desired. To do as much by hand would require a span of horses and a man to open the furrows with a plough, three men or boys to plant, and one man to scatter the fertilizer; and a span of horses and a man with a double mould board plough to cover the sets. There is a great advantage in using the planter, as there is no trouble with the clover, and in a dry time the results from planting with a planter are much better than by opening furrows and covering with the plough, as the set, when planting is done with the planter, is brought closer into contact with the soil and prevented from drying out. In a year, when there was a very severe drought, the writer knows of a case where in a field of potatoes planted with a planter there was practically a perfect stand, while a field of a neighbour just over the fence planted by hand and covered with a plough was practically a failure. If the planter is properly watched there will be few, if any, misses from sets not being dropped. In a very dry time when there is danger of the sets drying out, it is wise to roll the land before the potatoes are up, loosening it again with the harrow as soon as there is rain.

TILLAGE.

A few days after the sets have been covered by the plough and before the plants have been above ground, but not until the weed seeds have germinated, the soil should be harrowed with the smoothing harrow to level it and to kill the myriads of weeds which usually germinate about that season of the year. If possible, the soil should be harrowed twice before the potatoes are far enough up to be injured. If two harrowings are given there should be little trouble from weeds afterwards, and harrowing is a much more economical way of getting rid of them than by hand hoeing. As soon as the potatoes are far enough up so that the rows can be readily distinguished, the cultivator should be put in and the soil loosened between the rows to as great a depth as possible the first time and as near the sets as it is safe to go without disturbing them, so as to loosen the soil for the tubers. All future cultivation should be quite shallow to prevent injury to the roots and tubers. The soil should be cultivated every week or ten days, depending on the weather, the object being to keep the surface soil loose until the tops meet well between the rows. If the soil becomes baked evaporation of moisture will be very rapid.

Conservation of moisture is very important in growing potatoes and thorough cultivation is one of the best ways to retain moisture. The potato vines would not suffer from drought, as they often do in the middle of summer, if the soil were properly prepared to begin with and well cultivated during the early part of the season. The vines must be kept growing thriftily from the time they appear above ground until autumn if a maximum crop is to be obtained. If growth is checked in the middle of summer the crop suffers and the tubers when they start to increase in size when the rains come are very likely to become misshapen. A good cultivator is very essential in growing potatoes.

LEVEL *VERSUS* RIDGE CULTIVATION.

Many farmers owing to lack of help and sometimes through lack of knowledge, give no further attention to their potato crop after the beetles are killed and when haying begins, and as an end to the culture for the season they ridge up just before haying. There is no doubt some advantage in ridging over leaving the soil level when such conditions prevail, as the ridging will give the tubers loose soil to develop in, while the soil would soon get hard if left flat and not cultivated.

There are districts in Canada where the climatic conditions in summer are not very unlike those in Great Britain. In such districts ridging will probably as a rule give better results than level culture. There are, however, large areas where droughts are liable to occur and where conservation of moisture is a very important factor in obtaining a good crop. In such districts the best results will probably, as a rule, be obtained if thorough and deep working of the soil be given and by adopting level culture. The reason is easily apparent. The evaporation of moisture is not as great from level soil as from soil in ridges. Few experiments seem to have been tried for comparing level with ridge cultivation, but in the drier parts level culture has, as a rule, given the better results. It should be clearly understood, however, that unless the soil is well worked the better conditions of the soil for the development of tubers when it is ridged will offset the advantage of retaining more moisture by level cultivation.

It would be advisable for each farmer to try for himself whether level or ridge cultivation gives the better results under the conditions on his farm.

"SPROUTING" BEFORE PLANTING FOR EARLINESS AND INCREASED YIELD.

Where there is a demand for early potatoes it is important for the potato grower to know how he can hasten the development of the tubers, as the sooner the potatoes are on the market in good condition the more money he will make out of them as a rule. The method usually adopted by the best growers is to use an extra early variety and

"sprout" the potatoes before planting. Medium-sized tubers are selected before they have begun to sprout and placed in single layers in shallow boxes or trays with the seed end up. The boxes are then put in a bright, airy, cool place, where the temperature is low enough to prevent sprouting. After a few days the potatoes will turn green and the skin becomes much tougher than before the potatoes were exposed. The potatoes are now given a little more heat, but still kept in a bright, airy place. From the seed end will now develop two or three strong sprouts and the object of exposing the potatoes at first to toughen the skin is now apparent, for most of the eyes do not start and practically the whole strength of the potato is concentrated in a few sprouts at the end. This is what is desired, as the fewer sprouts there are the larger proportion of marketable potatoes there will be. If the potatoes are given plenty of light and the place where they are kept fairly cool, the sprouts will become very sturdy and strongly attached to the tuber and will not be broken off in handling unless very carelessly used. Tubers will develop more quickly from sprouts made slowly in a bright, cool, place than from sprouts which have grown rapidly in a dark place, and furthermore, the yields will be much heavier. Potatoes which sprout in the dark are, moreover, very difficult to handle, as the sprouts break off very easily. It is not absolutely necessary to place the potatoes with the seed ends up as very satisfactory results are obtained when potatoes are emptied indiscriminately into shallow boxes or trays and then treated as already described. The sprouts should be about two inches in length at time of planting. If longer the sets are more difficult to handle.

The warmest and best drained soil that can be obtained should be used for extra early potatoes and the sets should be planted shallow so that they will get the advantage of the heat from the surface soil. The potatoes are planted whole, as they do not rot as readily as cut pieces, and the sprouts also have more to draw on. The sprouts are, of course, left uppermost when the potato is planted. As most extra early varieties have small tops the sets may, as a rule, be planted a little closer than for the main crop.

PROTECTING POTATOES FROM INJURIOUS INSECTS AND FUNGOUS DISEASES.

The leaves of the potato vine must be kept intact and in a thrifty condition if a maximum crop is to be obtained, and both insects and diseases should and can be fought and conquered if the well-known and thoroughly tested preventatives and remedies are used.

Spraying for the Colorado potato beetle should not be delayed until the vines are badly injured, but preparation should be made to spray as soon as the larvæ or young bugs hatch. In about a week after the eggs are laid the young beetles or larvæ appear and begin to devour the foliage with a rapidity which is only too well known. The last brood of larvæ, which disappear into the soil before severe frost, pupate there, remaining in the ground in the form of perfect insects until the following spring. Fortunately, there are good remedies for this insect in Paris green, arsenate of lead, and other insecticides. The importance of preserving the foliage as nearly intact as possible has already been impressed on our readers. It is well known that the loss in a crop where the vines have been allowed to be devoured by potato beetles is enormous, the crop sometimes being scarcely worth digging. The longer the spraying is delayed the greater loss there will be. If cheap help can be obtained it will be advisable to spray the vines when they are quite small, or pick off the old beetles before they have deposited their eggs, but if help is scarce it may not be possible to do this, and the temptation to leave the old "bugs" alone is great, as they do little injury to the foliage. Unfortunately, on perhaps the majority of farms, nothing is done to destroy the potato

beetles until the foliage is noticed partly eaten. This is too late. By the time the poison takes effect the vines are badly injured and the future crop much lessened.

Potato growers should not wait until the vines are injured, but should be on the lookout for the young "bugs," and as soon as they appear an application of some good insecticide should be made. As the eggs are not all laid at the same time, the larvae do not hatch all at the same time, and it is usually necessary to spray several times before they are all killed. As it is important to kill the beetles as soon as possible, an insecticide which will act quickly is desirable, and also one that will adhere to the foliage. Paris green and arsenate of lead are two of the best poisons to use. Paris green should be applied in the proportion of 8 ounces or more Paris green to 40 gallons of water, with about 4 ounces of lime to neutralize the effect of free arsenic on the foliage. Four ounces of Paris green to 40 gallons of water will kill the insects, but does not act as quickly as eight ounces. If applied dry, a good proportion is 1 pound Paris green to 50 pounds slaked lime, land plaster or any perfectly dry powder. The dry mixture should be applied when the vines are wet, so that it will adhere better. There are strong advocates for both the wet and the dry mixtures. Wet mixtures may be put on at any time when the weather is fine, but if the best results are to be obtained dry mixtures should be applied only when the dew is on the foliage. If the dry mixture is put on when the foliage is moist it will adhere better than the wet mixture and will also be more evenly distributed. Arsenate of lead paste used in the proportion of two to three pounds to forty gallons of water, or powdered arsenate of lead at the rate of 1 to 1½ pounds adheres better to the foliage than Paris green, and is a good poison to use. It does not appear to kill quite so rapidly as Paris green, and a mixture is recommended of 8 ounces Paris green and 1½ pounds of paste arsenate of lead to 40 gallons of water. "Bug Death" dry and also in the proportion of 1 pound to 2 gallons of water, has been found a good insecticide, but is more expensive than Paris green.

The cucumber flea-beetle frequently does much harm to the potato crop, and being so small, is often not seen, but the results of its depredations will be found in the many small holes which may be noticed in the leaves and in the lessening of the crop on this account. Spraying with Bordeaux mixture and arsenate of lead will control this.

It is found that the parts of the leaves which are injured by the flea-beetle make suitable lodging places and points for germination of the spores of the early, and possibly, late blight. We believe that keeping vines covered with Bordeaux mixture and Paris green is the best preventative in this case.

THE EARLY BLIGHT OR LEAF SPOT DISEASE AND THE LATE BLIGHT OR ROT.

Although much of the premature killing of potato vines is due to the early blight, which is frequently mistaken for the late blight, the latter is by far the more serious disease, as it spreads with much greater rapidity and in addition to the killing of the tops causes the rotting of the tubers.

The late blight usually appears between the middle of July and the first of August, though sometimes earlier or later, depending on the season and part of Canada. The strong and disagreeable odour from a potato field where the late blight is at work is familiar to all, and although it is too late to get the best results after the disease has begun to spread rapidly, it may sometimes be checked by thorough spraying at that time. The loss from blight is usually greatest from the main crop or late varieties, as the early potatoes are usually well advanced before the conditions are the most favourable for the rapid development of the disease. The weather which appears to favour the spread of the late blight, is what is usually known as "muggy," or close days with much moisture in the air. With these conditions myriads of spores germinate, and the disease spreads through the tissues of the leaves and destroys them with great rapidity. The object of spraying is to protect the leaves with the Bordeaux mixture so that if the spores germinate they are killed by it.



Potatoes sprayed to prevent late blight.

Unsprayed potatoes.

In a three-year experiment conducted at the Central Experimental Farm in controlling late blight there was an average difference of 94 bushels per acre of marketable potatoes in favour of the sprayed. The importance of keeping the plants growing and the tops uninjured by insects and disease was well brought out in an experiment in Vermont where it was shown that there was an increase of 119 bushels per acre during the month of September when the tops remained green and uninjured.

The cost of spraying with Bordeaux mixture is not large compared with the great average increase in yield and value of the crop from the use of it. Some years the results may not be marked but it is the average results which should be considered. A good spraying machine is important.

FORMULAE RECOMMENDED.

Bordeaux mixture.—For Early and Late Blight and for Flea Beetles:—

Copper sulphate (bluestone)	4 to 6 pounds.
Unslaked lime	4 “
Water (1 barrel)	40 gallons. . .

Dissolve the copper sulphate by suspending it in a wooden or earthen vessel containing four or more gallons of water. It will dissolve more quickly in warm water than in cold. Slake the lime in another vessel. If the lime, when slaked, is lumpy or granular, it should be strained through coarse sacking or a fine sieve. Pour the copper sulphate solution into a barrel, or it may be dissolved in this in the first place; half fill the barrel with water, add the slaked lime, fill the barrel with water and stir thoroughly. It is then ready for use. It is important not to mix the lime water and the sulphate of copper solution before diluting.

A stock solution of copper sulphate and lime wash may be prepared and kept in separate covered barrels throughout the spraying season. The quantities of copper sulphate, lime and water should be carefully noted.

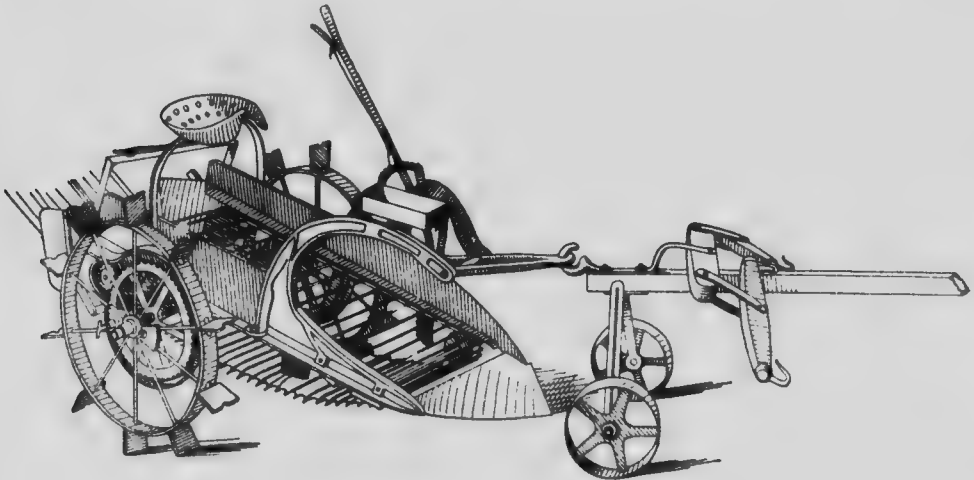
DIGGING POTATOES.

If potatoes have not been affected with late blight or rot the best time to dig them is as soon as the tops have died, if the weather is favourable. Potatoes are usually dug just after the corn is harvested or before the frost becomes severe enough to freeze the soil to a depth of an inch or so. This time of digging is usually chosen as a matter of convenience and quite irrespective of when the stalks die, as the latter dry up in many places about September 1, and often before, and the potatoes are frequently not dug until about a month afterwards. When the soil is well drained and not wet there is not much danger to the crop by leaving it in the ground for this length of time, but if there is no disease the sooner they are dug the better.

Potatoes which have been killed by late blight will usually rot as soon as the conditions are favourable, and for this reason a diseased crop is better left in the ground, as the tubers which are diseased will most of them show signs of rot before they have to be taken up on account of frost and they need not be picked up at all. If diseased potatoes are dug and stored as soon as the tops are dead, the disease will be almost certain to develop in the pit or cellar and healthy tubers will rot from contact with the diseased ones. It is not good practice to dig diseased potatoes early and pile them in the field. It is better to delay digging as long as possible and then put the potatoes in a cool, well ventilated cellar where the disease may be checked. Potatoes in wet soil should be dug sooner than those in that which is drier and well drained.

Potatoes should be dug in dry weather so that when they are taken to the cellar or store-room they will be perfectly dry. If the tubers are housed when wet the conditions become very favourable for the development of the disease which may affect them and for the rotting of the healthy potatoes from contact with those thus affected.

Where there are large areas to be dug a good potato digger is essential. Not only will a potato digger raise the crop more economically than a fork or plough but with it the grower is more likely to get his crop dug and picked up while the weather is fine, which is a great consideration. There are a number of good potato diggers now on the market which will dig up and leave on the surface of the soil practically all the tubers.



POTATO DIGGER.

STORING POTATOES.

Potatoes should be stored dry in a cool, well ventilated cellar which is perfectly dark. There is no doubt that great losses occur every year from the careless storing of potatoes which are put in wet in comparatively warm and poorly ventilated cellars and piled in great heaps, giving almost ideal conditions for the development of the disease which may be in them and very favourable conditions for rotting. The expense of putting in a good system of ventilation in a cellar would be soon offset by the better condition in which the potatoes would keep, and hence the more profit there would be from them. If it is not considered wise to go to this expense every effort should be made to have as good a circulation about the potatoes as possible. Instead of piling the potatoes against the wall or on the floor, slats should be nailed a little apart about six inches or more from the wall. This will give a circulation of air behind the pile. A temporary floor should be put down about six inches above the permanent floor with cracks between the boards. This will permit air to circulate under and through the pile. Then if the piles have to be made very large, square ventilators of wood made of slats and running from the top to the bottom of the pile could be put in here and there through the pile. These with the ventilation afforded at the sides and bottom will keep the potatoes in much better condition than if they were in a solid pile. Another good plan is to keep the potatoes in large crates made with slats close enough together to prevent the potatoes getting out. The ventilation between these crates would assist very much in keeping the tubers in good condition. Thousands of bushels of potatoes are lost every year when there is disease in the crop, by neglecting ventilation. The temperature of the cellar or storehouse should be kept as nearly 33° to 35° F. as possible. The cooler potatoes are kept without freezing the better. It has already been stated how much the value of the tubers for seed is lessened by sprouting, but they are also much injured for eating. Moreover, if the potatoes are held over to sell in the spring there will be a great deal of shrinkage in weight if potatoes are allowed to sprout. It is important to have some means of letting cool air into the cellar towards spring when it is difficult to keep potatoes from sprouting. The cool air should be let in at night when the temperature is lowest and the cellar kept closed during the day.

STORING POTATOES OUTSIDE IN COLD CLIMATES; MARKETING.

To store about 1,000 bushels, a hole in the ground 14 feet wide, 4 to 4½ feet deep, and about 30 feet long will give ample space. The sides and ends of the hole may be lined with boards to prevent earth from falling in, though the earth may be braced back with poles if boards cannot be readily obtained. Fill the hole to a height of 3½ feet with potatoes, then place logs along the sides and ends to hold back the earth thrown out and for supports for the poles of the roof. The depth of this side log and elevation in centre of roof is to be left as an air space and no straw or rubbish whatever is put on top of the potatoes. A roof is made with poles placed close together. There should be but a slight elevation at the centre of the roof.

When the poles for the roof are in place there should be a little hay thrown over them to keep the soil from falling through. The roof should now be well sodded and some of the loose earth which was dug out of the hole shovelled over the sods to make about 1 foot deep of earth and sods. Another foot of well rotted, dry horse manure will be sufficient during the coldest winter. The natural ground heat from the bottom will keep the temperature fairly even. In a pit this size there should be three ventilators each about 4 x 6 inches made of boards, one at each end and one in the centre. These should be put in when roofing. These are closed in the very cold weather with old sacks, and empty boxes then turned over them; when the weather becomes frosty the centre ventilator may be kept closed all the time. There should be no potatoes directly under the end ventilators as the drip of water from them might cause the potatoes to rot. A thermometer can be let down any time to test the temperature. In

a pit of this kind the temperature should not go much below 40° F. It is advisable to have a small space at one end to get to the potatoes in the spring. This should be sunk as deep as the pit and roofed over as the pit, and can be kept filled with manure or old bags during the winter to prevent frost getting in.

An inexpensive outside root cellar used at the Rosthern Experimental Station is described, and plans are illustrated, in Exhibition Circular No. 71 of the Experimental Farm Series.

There is usually more profit, taking one year with another, in selling potatoes as soon after digging time as possible. While occasionally when rot has been bad and the crop short throughout the country and one happens to have perfectly sound tubers it may pay to hold them over, yet on the whole it is wiser for the grower to sell at a fair price in the autumn as he thus avoids all the anxiety regarding the keeping of the crop and does not take any risk from probable losses.

IRRIGATION OF POTATOES.

BY W. H. FAIRFIELD, M.S., *Superintendent, Experimental Station, Lethbridge, Alta.*

There is an impression more or less general that potatoes grown with irrigation are apt to lack in quality; that when cooked they are inclined to be soggy or watery and less mealy and dry than are potatoes raised without the aid of irrigation. That there are grounds for this belief cannot be denied, for, if the crop is irrigated in a careless manner and too much water is applied, the resulting crop is almost sure to be poor in quality, as just pointed out. However, by using reasonable care and intelligence, this trouble may be easily avoided. To begin with, the land should be in good tilth. There is probably no better preparation than to summer-fallow the land the season previous to when the potatoes are to be planted. If an application of manure could be given before the land is ploughed for the summer-fallow, so that it would have a chance to rot during the summer, the yield of the following crop would be materially increased. Another quite satisfactory method is to manure the land in the spring and then raise a grain crop to be cut for green feed. This will leave the land relatively clean for the potatoes. As soon as a farmer on an irrigated farm has enough alfalfa seeded down so that he can afford to break up a four or five-year-old field to plant his potatoes on, he will have a field that will be certain to give large returns.

As indicated above, to avoid the possibility of producing potatoes of poor quality, care must be exercised as to when and how the crop is irrigated. It probably requires more skill and experience to raise potatoes successfully under irrigation than any other crop commonly grown here at the present time. The secret appears to lie in being able to keep the plants growing vigorously from the beginning with no set-backs, and on the other hand in being able to apply the water so that too sudden growth will not be induced at any time. If possible, the first irrigation should not only be very light, but it should not be given until the small potatoes are set and are perhaps the size of peas. This stage is usually about the time the first blooms appear. If the crop is wet before this time there is danger of the plants setting more potatoes than they will be able to develop to a marketable size. To be sure that the potatoes are not wet too much when the first irrigation is given, it is well to run the water between every alternate row only and turn it off just as soon as it gets through so as not to let the ground soak up any more than is necessary. As soon as the ground dries sufficiently, the land should be given a shallow cultivation. About ten days after the first irrigation, the second should be given. This time, the water may be run down between all the rows and should be allowed to remain running until the land is well wet. After irrigation has once begun, the land should never be allowed to dry out completely. Unless heavy showers

intervene, it will be found necessary, in order to maintain this condition, to irrigate about every ten days. After each irrigation, as soon as the surface of the soil dries sufficiently, it should be given a shallow cultivation. If, for any reason, after irrigation has once begun, the land is allowed to become relatively dry, the potatoes should not again be irrigated, for, if they are, a second growth is almost certain to be induced, and this will injure the quality, for the main cause of soggy potatoes being produced when grown under irrigation is from allowing the land to become somewhat dry so that the growth is checked and then applying and inducing a fresh growth of roots and tops.

COST OF GROWING POTATOES.

The cost of growing potatoes varies in different parts of Canada. Labour is more expensive in some provinces than in others. In certain parts of Canada there are no Colorado potato beetles to contend with and rarely any serious injury from late blight, making spraying not so important a part of the operations. In 1915 the cost of growing potatoes was recorded at several of the Experimental Farms and Stations and the details were published in the annual report for 1916 and will be found in the complete edition of this bulletin which will be sent to anyone who desires it. The cost of growing and marketing a 300-bushel per acre crop in the province of Ontario was estimated at \$80.58 per acre, to which should be added \$60 for the year 1917 on account of the high cost of seed.

VARIETIES RECOMMENDED.

Experimental Farm, Ottawa, Ontario.

Varieties recommended.—Early: Irish Cobbler (Eureka Extra Early) and Early Ohio for market gardeners where extreme earliness is desired. Main crop: Green Mountain, (including Gold Coin, Carman No. 1, and Wee MacGregor, which are very similar to it), and Empire State.

Experimental Station, Charlottetown, P.E.I.

Varieties recommended.—Early: Early Rose, Irish Cobbler. Main crop: Green Mountain, Table Talk, McIntyre. For Bermuda trade: Garnet Chili, and Bliss Triumph.

Experimental Farm, Nappan, N.S.

Varieties recommended.—Early: Irish Cobbler, Vick Extra Early. Main crop: Green Mountain, Wee MacGregor, Rawlings Kidney, Carman No. 1.

Experimental Station, Kentville, N.S.

Varieties recommended.—Early: Irish Cobbler. Main crop: Green Mountain, Delaware.

Experimental Station, Fredericton, N.B.

Varieties recommended.—Early: Irish Cobbler. Main crop: Green Mountain.

Experimental Station, Ste. Anne de la Pocatière, Que.

Varieties recommended.—Early: Irish Cobbler, Vick Extra Early. Main crop: Green Mountain.

Experimental Station, Cap Rouge, Que.

Varieties recommended.—Early: Irish Cobbler. Main crop: Table Talk, Carman No. 3, Gold Coin, Davies Warrior.

Experimental Station, Lennoxville, Que.

Varieties recommended.—Early: Irish Cobbler. Main crop: Green Mountain.

Experimental Station, Morden, Man.

Varieties recommended.—Early: See Brandon list; Early Oh' is popular in the district. Too soon yet to recommend any from experience at the Station. Main crop: see Brandon list.

Experimental Farm, Brandon, Man.

Varieties recommended.—Early: Bovee, Hamilton Early, Early White Prize. Main crop: Empire State, Wee MacGregor, Rawlings Kidney.

Experimental Farm, Indian Head, Sask.

Varieties recommended.—Early: Early Ohio, Vick Extra Early, Irish Cobbler. Main crop: Wee MacGregor, Gold Coin, Carman No. 1.

Experimental Station, Rosthern, Sask.

Varieties recommended.—Wee MacGregor, Irish Cobbler, Everitt, Early Ohio, Rawlings Kidney, Dreer Standard.

Experimental Station, Scott, Sask.

Varieties recommended.—Early: Everitt. Main crop: Wee MacGregor.

Experimental Station, Lethbridge, Alta.

Varieties recommended.—Early: Irish Cobbler, Vick Extra Early, Rochester Rose, Reeves Rose. Main crop: Gold Coin, Wee MacGregor, Table Talk, Empire State. Irish Cobbler makes both a good early and a good main crop potato in places where the soil is rich and the season short, as it yields well and ripens well, ensuring good quality.

Experimental Station, Lacombe, Alta.

Varieties recommended.—Early: Irish Cobbler, Houlton Rose, Early Norther. Main crop: Table Talk, Empire State, Wee MacGregor, Epicure.

Experimental Station, Invermere, B.C.

Varieties recommended.—Early: Irish Cobbler, Eureka Extra Early. Main crop: Wee MacGregor, Late Puritan, Clyde, American Wonder, Table Talk. Conquering Hero is of especially good quality.

Experimental Station, Summerland, B.C.

Varieties recommended.—Not sufficient experience yet to recommend any varieties especially.

Experimental Farm, Agassiz, B.C.

Varieties recommended.—Early: Irish Cobbler, Early Rose, Rochester Rose, Early Hero. Main crop: Gold Coin, Dreer Standard, Empire State, American Wonder, Carman No. 1. The variety called Sutton Reliance is much grown on the lower mainland of British Columbia.

Experimental Station, Sidney, Vancouver Island, B.C.

Varieties recommended.—Early: Irish Cobbler, Eureka Extra Early. Main crop: Factor, Table Talk, Million Dollar, and Netted Gem. Varieties most popular on Vancouver Island: Sir Walter Raleigh, Million Dollar, Up-to-Date, Netted Gem, and Eureka Extra Early.